2010

Mission: Homeland Security: Resilience through Education and Research

NAVAL POSTGRADUATE SCHOOL

SPECIAL REPORT

MISSION: HOMELAND SECURITY

RESILIENCE THROUGH EDUCATION & RESEARCH

NAVAL POSTGRADUATE SCHOOL

CENTER FOR HOMELAND DEFENSE AND SECURITY

MASTER'S AND PH.D. DEGREES

Homeland Security and Defense - offered to U.S. military officers (classified program); Systems Engineering; Operations Research; Computer Science; Modeling, Virtual Environments and Simulation (MOVES); and more. . .

RESEARCH

CRITICAL INFRASTRUCTURE

- Constructing optimization models to improve real systems
- Improving disaster relief communications through Hastily Formed Networks (HFN)

CYBER SECURITY

- Identifying cyber vulnerabilities
- Developing strategic security architectures

HUMAN SYSTEMS INTEGRATION AND ARTIFICIAL INTELLIGENCE

- Advancing human-centered design and operations of complex systems
- Creating artificial intelligence to monitor and analyze behaviors

MARITIME DOMAIN AWARENESS

- Conducting maritime cooperation and interdiction operations
- Sharing situational awareness capabilities

TECHNOLOGY

- Leveraging existing technologies for evolving security needs
- Deploying mobile research facilities that contain satellites, wireless networks, video surveillance, and broadband connectivity
- Producing and refining uses for unmanned aerial vehicles, autonomous underwater vehicles, and unmanned surface vehicles

INTERAGENCY COLLABORATION

- Increasing U.S. and international cultural awareness
- Building partnerships with U.S. military; international governments; non-governmental organizations; local, state, federal, and tribal security practitioners; and maritime industry and maritime security forces

MASTER'S DEGREE PROGRAM

- Teaches homeland security management, strategy and analytic skills
- 18-month program is a blend of in-residence and network-based learning
- A network of over 300 graduates across the nation

EXECUTIVE LEADERS PROGRAM

- Designed for busy senior level homeland security officials and leaders
- Does not require the academic workload of traditional graduate level programs
- Strengthens working relationships of leaders across jurisdictional lines

EXECUTIVE EDUCATION SEMINARS

- Customized seminars delivered to state and local elected officials at their jurisdictions by CHDS Mobile Education Teams
- Participants identify threats and challenges of the locale to improve planning for catastrophic events

SELF-STUDY COURSES

- Non-credit courses are developed from the CHDS Master's curriculum
- Allows the flexibility of self-paced study

HOMELAND SECURITY DIGITAL LIBRARY

- The nation's premier collection of documents relating to homeland security policy, strategy, and organizational management
- All materials are selected and evaluated by a team of librarians and subject-matter specialists
- Assists academics in homeland defense and security research

ADDITIONAL RESOURCES & MEDIA

- Homeland Security Affairs, an online journal
- Viewpoints: podcasts and videos
- On the Homefront: Homeland Security Digital Library Blog
- Dystopia, a simulation environment for training
- Critical infrastructure protection simulation software

WWW.NPS.EDU

WWW.CHDS.US

OUT OF THE ASHES

HOMELAND SECURITY

The appalling terrorist attacks of 9/11, the devastation of Hurricane Katrina in 2005, and the unknown – this is the domain of homeland security. Rising from the ashes of the Word Trade Center was an entirely new discipline, one that would be required to protect the nation from extremists, to be ready and responsive to natural disasters of all kinds, and be resilient enough to combat future threats that are, to date, unknown.

With this critical mission in hand, advancements to the practice of homeland security demand an all-encompassing approach that brings together the nation's brightest minds.

A federal university in Monterey, Calif., celebrating its 100-year anniversary, would become the nexus for this development, providing technical research and pioneering advanced education that are the pillars of a determined and resilient response to the varied manmade and natural threats that are homeland security.

This is the story of Mission: Homeland Security, Resilience Through Education and Research.

Joseph Pfeifer, now an Assistant Fire Chief with FDNY, was the first chief on the scene at One World Trade Center on September 11, 2001. Before his promotion to Assistant Chief, Pfeifer, a CHDS alum, served as the department's Chief of Counterterrorism and Emergency Preparedness, a job unheard of prior to the development of the homeland security profession. Photo Courtesey Gary Marlon Suson

For Joseph Pfeifer, the horrific events of September 11, 2001, are firmly etched into his memory. As the first chief to arrive at One World Trade Center that morning, he witnessed in extraordinary awe a day that no American could easily forget.

Pfeifer was a Deputy Assistant Chief with the New York City Fire Department (FDNY) at the time, and he survived the collapse of the twin towers that day … a day that too many of his FDNY and NYPD brethren, and fellow Americans, did not. He remembers it as a day that not only changed the world, but also changed his profession forever – how he and so many other first responders around the country could no longer think the same way about what they do.

"It really redefined what you think about when you go into different emergencies," he said. "You're questioning if this is an accident or a deliberate incident. The mindset has changed."

Like Pfeifer, the mindset of the entire nation had indeed been forced into change. No longer could national security be defined through the same lens; no longer could Americans feel secure through the same means.

Out of the ashes left by the attacks came a revived sense of resilience, a hardened response, and a new discipline – homeland security – a profession that is now the domain of everyone from firefighters to emergency response managers, from police officers to everyday citizens.

Homeland security has evolved through the years. Through its development flows a river of disaster response plans, inter-agency information sharing, maritime security task forces, and more eyes and ears on the ground, with greater vigilance than ever before and now includes dangers ranging from terrorists attacks to natural disasters to cyber-havoc.

"I'm particularly proud of the fact that we are able to export our curriculum to dozens and dozens of colleges and universities around the country so that they can copy what we are doing."

- Daniel Oliver, President
Naval Postgraduate School

But this evolution is not by accident, and nor is it without challenge. With such varied threats, advancements to HLS must be made across a wide spectrum of disciplines in order to mitigate the destruction of each threat, but how can this be done? Is there a place where the wide-ranging practice and science of HLS can be examined, refined, improved and shared with the world?

There is indeed such a place. And appropriately, it's an academic institution that has been educating military officers in graduate-level, defense-relevant fields of study for 100 years.

The Naval Postgraduate School (NPS) has conducted cutting-edge research in direct support of the Department of Defense for decades. But when the country suffered the attacks of Sept. 11, the university responded. Many of the school's research programs began looking at applications beyond the military arena to provide support for both the warfighters overseas, and first responders on the home front.

"There is no other institution in the country quite like the Naval Postgraduate School," said NPS Executive Vice President and Provost Dr. Leonard A. Ferrari. "Our graduate-level research programs have direct applications to the tactical and strategic missions of the Defense Department and Homeland Security, and are invaluable assets to this nation.

"No where else can you find graduate students with operational backgrounds working with some of the top researchers and professors in their fields on defense-related issues," he continued. "Our unique educational and research environment is truly unmatched, and is what has helped make NPS a leader in homeland security research."

Now just over eight years since that fateful day, the results of NPS' efforts are strikingly undeniable. Many of the policy, practice and technological responses to homeland security in effect across the globe since 9/11 have emanated from the university's campus in Monterey, Calif. And on that same campus, already well versed in researching national security's deepest threats, the education of HLS would be pioneered.

Creating the Center

As the fledgling field of homeland security began to unfold, a core group of visionary leaders across various government agencies, and at NPS, came together with a common understanding that an academic approach to HLS would provide a wealth of benefits to the nation. The idea of creating a curriculum and master's degree program from scratch was daunting enough. Equally challenging was the prospect of developing an entire Center that addressed the new strategy and policy needs of local, state, tribal, federal and military officials. This required collaboration at the highest levels of these agencies. On April 11, 2002, following several months of intensive staff work, CHDS (Center for Homeland Defense and Security) was established by an interagency agreement between the U.S. Department of Justice's (DOJ) Office of Justice Programs (OJP), Office for Domestic Preparedness (ODP), and the Naval Postgraduate School. This agreement envisioned a real-world curriculum to develop the next generation of homeland security leaders who would be needed to defeat terrorism. This educational approach linked research, strategic thinking and policy-making to preparedness for, and prevention of, domestic threats.

This collaboration was the first of its kind in what has evolved into the dynamic field of homeland security.

With a specific directive, CHDS was challenged to educate and prepare a national cadre of local, state and federal leaders in this new discipline, leading the charge at all levels of government to secure the nation's homeland. Cutting-edge research would be required to advance the new field and these new professionals would have to be key players in this effort. And finally, CHDS' Congressional mandate was very clear in its emphasis on following an 'open source' model, where educational curricula, programs and tools developed at this new center would be available to the nation, expediting the creation of a country-wide HLS educational system.

The marching orders for CHDS were quite clear, and fortunately, the Center was created at the right place to meet that challenge.

"Locating the Center for Homeland Security at the Naval Postgraduate School allows us to tap into a wealth of academic expertise on security issues," said Andrew Mitchell, Director of the Preparedness Coordination Division of the Federal Emergency Management Agency. "That, in turn, positions us to educate the next generation of homeland security leaders."

NPS is first and foremost a university, a learning environment that shapes policies and programs, refines strategies and develops technologies, all with a single mission in mind – to improve the national security of the United States. CHDS, or the Center as it has come to be known, was immediately able to draw upon the longstanding disciplines crafted at the campus in areas such as network and collaborative theory, political science, resources allocation and strategic planning, said Ted Lewis, CHDS Executive Director.

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- Glen Woodbury, Director
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NPS Exec. Vice President and Provost

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With that foundation, CHDS built expertise in the unique issues facing law enforcement, public health, fire service and emergency responders, all of whom work in varied layers of federal, state, local and tribal governments. What resulted was a cohesive study into the practice of homeland security, and a fully-accredited master's degree program that was the first of its kind.

While NPS expertise laid the foundation for CHDS, according to university President Daniel T. Oliver, the benefits are indeed reciprocal. The Center brings a significant number of civilian students who would not otherwise be here, Oliver noted. In addition, faculty who participate in CHDS academic offerings can bring that expertise back to the NPS classroom.

"Because our faculty is able to participate in these courses, it gives them a depth of understanding and knowledge they can bring back into our traditional curriculum," Oliver said. "I think it fleshes out our portfolio in a very nice way. I'm really proud that we have the Center. I think we're all better off for it."

Not only has CHDS educated homeland security professionals, it offers its curriculum materials to partner universities. "I'm particularly proud of the fact that we are able to export our curriculum to dozens and dozens of colleges and universities around the country so that they can copy what we are doing," Oliver added.

A New Kind of Security Professional

CHDS has expanded its offerings to include several non-degree academic programs, and in many ways, has informally unified the nation's network of terror watchdogs by bringing people from varied backgrounds and disciplines in to advance homeland security in a way that transcends the bureaucratic bounds of local, state and federal agencies.

Add into this mix the university's Homeland Security and Defense curriculum, part of NPS' School of International Graduate Studies, which takes a rigorous academic approach to homeland security through the eyes and cumulous responsibilities of the Department of Defense. This degree provides military officers with an in-depth exploration of DoD's role in deterring and preventing attacks on United States soil, and in consequence management should an attack occur, creating a very unique kind of officer graduate.

Put it all together, and you have the creation of a new kind of professional. A diverse group of first responders, military officers, civilians and the like representing an ever-expanding range of organizations and agencies – but all cohesively bound through an advanced education in this developing field.

"I think that's what we have created, it's that cadre of people that didn't exist before," said Dr. Jim Wirtz, Dean of the School of International Graduate Studies at NPS. "They are the ones pushing forward in terms of fusion of data and sharing of information and breaking down barriers so we don't have the problems that plagued us on 9/11. It's really an informal group of people across the United States that will work together to solve problems. That's very positive for the country."

While the Center is developing this new kind of professional, research efforts into advanced technologies and seamless communications at NPS will ensure they can indeed collaborate and connect. For first responders and government agencies, accurate information and efficient communication across all agencies and levels is critical for cooperative action, especially in times of unexpected crises.

The Hastily Formed Networks (HFN) Research Group played a significant role in providing disaster relief communications following Hurricane Katrina, and supports critical research that is improving the effectiveness and efficiency of disaster relief operations and collaborations between the United States, foreign governments and non-governmental organizations.

Part of NPS' Cebrowski Institute, a significant portion of the group's research is dedicated to portable communications equipment and power generation systems that utilize renewable energy sources. One of its resources, a mobile and fully self-contained research platform called Nemesis, is a 33-foot motor coach equipped with satellites, wireless networks and video surveillance. This mobile research facility can deploy across the U.S. in support of field research, disaster relief and security exercises.

In fact, when Nemesis was deployed to Mississippi in support of Katrina disaster relief operations, the HFN team had full broadband connectivity available for several public agencies working in the area within five hours of arrival.

Remember Pfeifer? He is one of those 'new professionals' – a graduate of CHDS whose job title now is FDNY's Chief of Counterterrorism and Emergency Preparedness, a job unheard of for a career firefighter prior to the 9/11 attacks. FDNY now has a 45-page terrorism and disaster preparedness strategy, which sets forth a three-tiered system of response and outlines training different personnel for each level of response.

"A lot of the ideas we talked about at NPS are in that document," Pfeifer said. The department has placed some 17 fire personnel in CHDS' master's degree program and another half dozen or so in the Center's Executive Leaders Program.

"You need knowledge about the culture . . . so that you understand what normal is for a community. You have to look for anomalies, because the bad guys' M.O. is to hide in plain sight."

- Dr. Jim Wirtz

Dean, NPS School of International Graduate Studies

"The only way you can embrace change is if you collaborate with others who see things from a different perspective. I can't imagine the nation being prepared without the collaboration that is stimulated at the Center."

- Major General Timothy Lowenberg, Adjutant General, Washington Army and Air National Guard

"The department is not just depending on one person to push the initiative, it allows people from the lieutenant on up to the staff chief to think about the threat environment and how the department needs to change to reflect that environment," Pfeifer said.

Study at the Center has spawned the department's participation, along with 15 other major cities, in a program known as Fire Intelligence Enterprise, where firefighters are trained to share and receive intelligence. Also, FDNY is developing what it calls an Electronic Command Board, which is a laptop computer that will allow incident commanders the ability to see unit deployment, digital blueprints of buildings (those blueprints are being used already), along with live video of an incident scene shot from police or media helicopters. That data is fed into the command board, something that gives commanders more information to shape their decisions.

Think Strategically, Protect the Nation

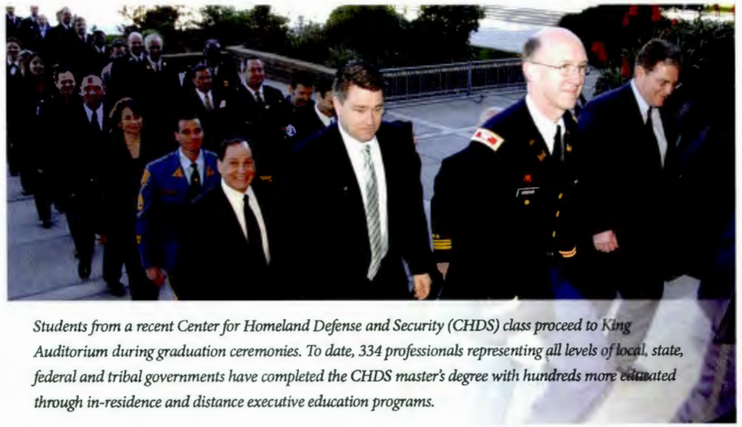
National infrastructures present an obvious target to terrorists seeking massive disruptions to the daily lives of Americans. Preventing attacks on the nation's most critical infrastructure requires a strategic approach, and NPS' Operations Research department is playing a key role in developing models to find weaknesses and prevent domestic attacks.

Dr. Gerald Brown, an Operations Research (OR) Distinguished Professor, is one of three NPS professors recently elected to the National Academy of Engineering, and regularly advises Congress on matters of his expertise. He also recently advised Vice Adm. Mel Williams, Commander of the U.S. Second Fleet, on the Navy's massive Trident Warrior exercise.

But what Brown does on a day-to-day basis is build complex mathematical models of real systems, and uses them to understand how those systems operate and how to improve them. Part of the OR department's research efforts include "red teams" of military officer students who are tasked with gathering knowledge from public sources about a specific infrastructure system, such as the Washington, D.C. Metro system. They are then asked to build a model that represents how its operator would manage it either in normal times or after a signal event, such as a terrorist attack.

"Our operations research program is still the only one on the planet that requires each student to engage in one of these red teams. The optimization modeling we have developed represents these two-sided 'defender-attacker' models, where we have to make our defensive preparations in full view of the attacker, who then gets to choose his course of action," Brown explained.

"This is an important element of the research, because terrorists will not flip a coin to choose a course of action," he added. "They are intelligent, goal-driven and will choose a course of action that is most advantageous to their perspective."



Students from a recent Center for Homeland Defense and Security (CHDS) class proceed to King Auditorium during graduation ceremonies. To date, 334 professionals representing all levels of local, state, federal and tribal governments have completed the CHDS master's degree with hundreds more educated through in-residence and distance executive education programs.

Because the country's infrastructure relies heavily on computer technology, identifying vulnerabilities subject to exploitation from potential attacks is a daunting challenge. The Computer Science Department at NPS is one of the nation's strongest in cyber security. Due to its knowledgeable and highly experienced faculty, NPS significantly contributes to the development of strategic security architectures and highly trustworthy systems.

Case in point is NPS' Center for Information Systems Security Studies and Research (CISR), which addresses information assurance needs, and is the country's leading center for defense-related research and education in trustworthy systems and defensive information warfare. Designated as a National Center of Excellence in Information Assurance and Information Assurance Research by DHS and the National Security Agency, CISR examines malicious software and system subversion, and develops technology to enforce critical security policies.

The Art of Collaboration

For Adjutant General Timothy Lowenberg, head of the Washington National Guard, strategic thinking means thinking critically, and he believes education is paramount to the ability to do just that.

"[The Center] has benefitted us because the people who have participated have directly had their horizons expanded," said Lowenberg, who completed the CHDS Executive Leaders Program. "That has had a collateral effect on the people around them. It bleeds off into the rest of the organization."

Like so many others, Lowenberg cites the increased cooperation and collaboration among local, state and federal security practitioners as one fruit of an education dedicated to homeland security.

"I believe the constant is change," Lowenberg said. "The only way you can embrace change is if

you collaborate with others who see things from a different perspective. I can't imagine the nation being prepared without the collaboration that is stimulated at the Center."

Lowenberg offers one such example of collaboration in the Northwest that led to significant improvements in security to his region. The effort, a collaboration among 45 state, local, federal and tribal agencies, created a radio protocol that covers the rugged and challenging Olympic Peninsula, an area he calls "a communications nightmare."

"It didn't require anyone to abandon their legacy communications systems," he said. "The bottom line is we enhanced our security by having seamless communication ability where none existed before."

It seems the simple lesson is that diverse groups working in cooperation yield results. Perhaps that lesson is best displayed with NPS' Field Experimentation Program, headed by Dr. Ray Buettner. The program takes several different concurrent research efforts at NPS and binds them into a cohesive, collaborative effort, culminating in a weeklong field experiment at Camp Roberts, Calif., each academic quarter.

"The Field Experimentation program is really an inherent advantage for NPS," said Buettner. "It is an alignment of some our best independent research programs that are in support of our sponsors, faculty and students, and it may be one of the best field experimentation programs in the world."

One of those experimentation programs, the U.S. Special Operations Command-NPS Field Experimentation Cooperative, evaluates and experiments with technologies that are unique, adaptable, and readily available for special operations forces use right now. The goal is to get the right equipment, fully tested, evaluated, perfected and into the hands of operators as fast as possible. And by the way, the cooperative's secondary objective is to examine dual-use capabilities of these same technologies for homeland security, reconstruction and humanitarian assistance.

Another effort through the Field Experimentation Program is the Research and Experimentation for Local and International Emergency and First Responders, or RELIEF. Researchers involved in RELIEF are currently leveraging existing technologies to meet the challenges posed by natural and man-made disasters. The program is intended to assist first responders and local officials in issues that arise in both domestic and international environments. An important

It may look like an ordinary RV, but it's actually the NPS Hastily Formed Networks group's Nemesis, a self-contained, fully-equipped communications research platform. When deployed to Mississippi in September 2005 in support of Katrina disaster relief, the team had full broadband connectivity available for several public agencies working in the area within five hours of arrival. The HFN group acted quickly after the earthquake in Haiti in early 2010, sending a team of researchers to establish emergency communications within days after the devastating event.

objective of RELIEF is to connect various organizations typically involved in humanitarian assistance/disaster relief – non-governmental organizations; local, state and federal agencies; and the military – and help them achieve common goals for effective recovery.

Out of the Classroom, Into the World

Success stories like Nemesis, the Olympic Peninsula in Washington, the Field Experimentation Program and New York City's Command Board are just a few examples of how the education and research at NPS and CHDS are finding their way to practices and policies on the street. "There are many cases where theses have been turned into policies and strategies to build homeland security," Lewis notes proudly.

But the security threat is ever-evolving, and the collaboration between faculty and students at the Center, in addition to unique student/faculty research efforts at NPS, must continue producing results that DHS and other agencies can use right away.

Retired Navy Capt. Jeff Kline spent more than 20 years as a Naval officer before joining the Operations Research faculty at NPS. Kline served as Commanding Officer of two ships during his career, including one of the Navy's few Pegasus class hydrofoils.

Kline is one of the nation's foremost experts on border and maritime security, essential to protecting the physical and economic safety of the country. He is head of the National Security Institute's Maritime Defense and Security Research Group (MDSR), an umbrella organization for more than a dozen initiatives at NPS. MDSR focuses on three core research areas: at sea, in port and field experimentation programs; exploratory research programs; and education and red cell programs.

"Our program explores strategic and tactical issues that range from how boarding teams receive information, to how the national command authority understands the maritime picture," explained Kline.

"MDSR's role is not to just execute this research but to also do so in the most collaborative, interagency way possible," he continued. "For example, another one of our programs deals with coordinating information exchange with maritime industry and maritime security forces like the Coast Guard and the U.S. Navy."

Two of MDSR's largest initiatives are the Cooperative Operations and Applied Science and Technology Studies (COASTS) and the Tactical Network Topology, which in part, deal with maritime interdiction operations and the use of the latest technology in them. MDSR explores projects that are of the highest classification, dealing with the use of national sensors and integrating that information into unclassified sources to provide a better understanding of the maritime domain and awareness picture.

COASTS has been a highly-successful research effort, working with international partners to develop and assess technologies for networking and shared situational awareness capabilities. Their work specifically explores technologies for use with the military, law enforcement and first responders. This multinational research and experiment program is one of the largest in the world and works closely with allied forces. An experiment from 2007 tested a maritime dirty bomb scenario, exploring various scenarios to smuggle dirty bombs into U.S. ports. The experiment assessed technological resources that could sense, track and monitor a potential dirty bomb threat, and tested coordination and interdiction capabilities.

But perhaps what is best of these efforts is that students are directly involved in all aspects of them. They take their educations out of the classroom, and into the field where they gain experience in new technologies ultimately where they will be used.

This is commonplace at the Naval Postgraduate School. Faculty members throughout the NPS campus and at CHDS are taking their research out of the classroom to where it can benefit HLS the most. Dr. Thomas Mackin of the Center is evaluating DHS' critical infrastructure protection risk tools. Other CHDS faculty/student efforts have impacted policies on how radioactive waste is transported in Illinois; how the New Jersey Highway Patrol addresses the state's petrochemical industry and critical infrastructure; and how the U.S. Coast Guard analyzes risks in ports.

With expert practitioners and faculty converging at the Center, course material is often developed in near real-time, said Lewis. For example, he is in weekly contact with U.S. Coast Guard personnel, who are former students, regarding the latest developments in risk assessment. Similarly, faculty member Dr. Seth Jones is currently serving in Afghanistan as Senior Advisor and Plans Officers for the Commanding General, U.S. Special Operations Forces. "Seth's experience makes his class almost a real-time comparative government course," Lewis said.

As the academic discipline of homeland security continually transforms, NPS and CHDS continue their roles of fostering safety at home while keenly working on an international scale as well.

Homeland Security, International Scope

At NPS' School of International Graduate Studies, students examine collective defense and security building with a global emphasis.

Gaining knowledge of culture and customs in potential trouble regions around the world – specific regions in the Middle East or Africa, for example – is an invaluable tool in maintaining homeland security, according to Wirtz. He likens it to the community-based policing concept popular in some American cities: Knowing the neighborhood culture helps police know when something is amiss. The same is true for security issues.

"You need knowledge about the culture and the community," Wirtz said. "It's really community based so that you understand what normal is for a community. You have to look for anomalies, because the bad guys' M.O. [mode of operation] is to hide in plain sight. They want to blend in as much as possible. Regional studies can help with that by helping local officials understand the cultures they are encountering."

Jeff Malnick, a research associate in the MOVES Institute, demonstrates the organization's state-of-the-art motion capture studio. MOVES pioneered the use of modeling and virtual environments for training purposes, and was the birthplace of America's Army – the official game of the U.S. Army and one of the most popular online games ever created. That expertise now impacts HLS through in depth research in automated behavior analysis, training simulations and more.

Prior to playing a major role in the creation of CHDS, then NPS Professor Dr. Paul Stockton cofounded the Center for Civil-Military Relations (CCMR) in 1994. Stockton, who is the current Assistant Secretary of Defense for Homeland Security and Americas' Security Affairs, is a widely-recognized visionary, able to see what the country, and government, will need to succeed well in advance. He knew that creating an academic approach to homeland security would greatly benefit the discipline of HLS, thus helping to create CHDS. Similarly, Stockton and CCMR cofounder Dr. Don Abenheim knew that bolstering stability and relations between civilian and military institutions through education would greatly impact combating terrorism. CHDS is in a way a civilianized counterpart to CCMR, both seek to bring disparate parties together to educate and analyze policy.

"The central idea of taking a whole bunch of people who may not normally talk to each other and using advanced education in the pursuit of more effective public policy as our guiding light, that common idea and goal links us together," Abenheim said.

In addition to instruction on the NPS campus, CCMR also takes its Mobile Education Teams abroad to countries to analyze actual threats as well as their underlying causes.

"We have a combating terrorism program," CCMR Director Richard Hoffman said. "We also address combating terrorism in the broader sense of all threats to security and the roles and missions of security forces. We address with other countries their definition of homeland security, their capabilities for it and their plans for it."

Born out of the demise of the Cold War era, CCMR has seen the face of security threats change, but its expertise in the role of the military in relation to the citizenry has remained applicable to modern-day perils of religious and ideological extremism. The consistent question is how far the military should go in protection versus how the government should preserve civil liberties.

"I think Sept. 11 forced this country to think once again very fundamentally about citizenship and government, and the ends and means of strategy, in a way that was very much on the minds of Central and Eastern European countries in the late '80s and early '90s, but wasn't very

much of an issue in this country," Abenheim said. "These are classical questions we (the CCMR) have addressed long before Sept. 11, and have addressed quite successfully since."

While nation building, the role of the military and ideology all remain hallmark components of homeland security study, the face of domestic security has expanded in the eight years since the 9/11 attacks.

Adapting to Changing Threats

Over the years, the focus of homeland security at CHDS has evolved from that of weapons to natural disasters in the wake of 2005's Hurricane Katrina. This gave rise to what came to be known as the "all hazards" approach to homeland security, where everything from weapons attacks to natural disasters is considered homeland security.

Thus, course topics are ever-evolving as new threats surface and old ones wane. CHDS professors update courses as a matter of practice. "If a course isn't making 30 to 35 percent changes every time it's taught, it's not being done right," Lewis said. "I think everyone on the faculty is aware that it's a changing field. The target keeps changing."

But what also keeps changing are techniques, technologies, and focal points for study. Over the last few years, significant attention has been paid to the role of humans and the behaviors they exhibit, and what clues to their actions can be garnered from this. NPS researchers are developing technology systems that assess human and behavioral factors in hopes of early prevention and preparation for threats posed by individuals and groups.

Dr. Rachel Goshorn, a young, up-and-coming member of NPS' Systems Engineering faculty, is leading a group of students in the development of the "Watchman," a camera network system that utilizes artificial intelligence to monitor and analyze behaviors that could indicate a possible security threat.

Using a combination of fixed and mobile sensors, the Watchman networks visual information to a central command and control center, which then automates any abnormal behaviors that could signal a security threat.

Goshorn said the system could potentially be used to provide automated security for airports, ports and along borderlines. It is comprised of five main functions: personnel detection and tracking; behavioral analysis; system alerts; facial recognition; and automatic personnel mustering.

Vital to mission homeland security is protection of our nation's critical infrastructures. Students and faculty at NPS and the Center study how these systems operate, and examine with great scrutiny where vulnerabilities exist. Detailed, sophisticated models are developed in NPS' Operations Research department that directly address those vulnerabilities and are freely shared with agencies across the country.

"The future of net-centric warfare and homeland security is going to be this artificial intelligence automation … and what we're doing is taking two typically independent systems – networked sensors and behavior analysis and artificial intelligence – and bringing them together to create this system," Goshorn said. "Using sensors and surveillance will help predict potential attacks on the homeland and abroad, but to provide the most efficient protection 24 hours a day, automation is really the key."

Innovative approaches to national and homeland security must run in the Goshorn family; Rachel's sister, Deborah, is a research associate at the NPS Modeling, Virtual Environments and Simulation (MOVES) Institute. MOVES is a world-recognized leader in virtual modeling and simulation, and utilizes the technologies with defense and homeland security partners to train personnel and analyze systems.

For example, a MOVES team of researchers is working with the University of North Carolina-Chapel Hill and the Sarnoff Corporation on a different kind of automated system, which can be used for training by tracking the movements of individual members of an infantry unit.

The Behavior Analysis and Synthesis for Intelligent Training (BASE-IT) is a state-of-the-art training system for pre-, in- and post-performance evaluations using behavior analysis, review and behavior synthesis of selected training events. Using a network of optical sensors and individual global positioning systems, BASE-IT can record the physical movements of individuals training for military operations. The system monitors everything from individual posture to group dispersion and even the number of times an individual turns his head to scan the surrounding environment. The system then uses the data to assess the physical behavior and actions undertaken by individual and group participants. Although BASE-IT is currently being developed for the U.S. Marine Corps, its fundamental technology could also have potential applications for the training of first responders and other homeland defense organizations.

At the Naval Postgraduate School, unrivaled academic excellence, tradition, ultra-modern technology and advanced research are being achieved from a global perspective aimed at keeping the United States secure from international and domestic threats. Reinforcing the NPS mission is the school's Center for Homeland Defense and Security, an organization that has set the gold standard in educating a new generation of primarily non-military professionals in leadership and strategic thinking needed to prepare the country for defense against the ever-evolving threats to its domestic security.

The Center and NPS continue to partner, united in their mission to protect American security by creating a national treasure found nowhere else in the country.

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